PROCESS FOR CONTROLLING OPERATION OF A FLOTATION CELL

Background of the Invention

This invention relates generally to processes for aerating suspensions. More particularly, the present invention relates to processes for flotating suspensions.

It is known that operation of a flotation cell can be controlled by means of the liquid level in the flotation cell, the amount of foam overflowing, and the throughput, where the throughput is pre-defined by the required production level.

Known control systems have the disadvantage that they are relatively inflexible. In particular, it is difficult with the control systems known to achieve a favorable compromise between the quality of the accept leaving the cell on the one hand and the energy input and loss of potentially recyclable materials on the other.

DE 42 25 117 C1 presents a control system in which, among other things, the foam back-up height in the foam channel of a primary flotation cell is measured and the amount of accept leaving the primary cell controlled on the basis of this measurement, thus the back-up height in the foam channel of the primary flotation cell remains constant. According to a similar principle the proportion of backfeed to the primary cell is also controlled in the secondary cell, based on the level height in the foam channel to the secondary cell.

This process, however, also does not provide a more flexible means of controlling operation in a flotation cell.

The problems with the state-of-the-art processes also occur in flotation of pulp suspensions, particularly in deinking flotation.

Deinking flotation is a process for removing contaminants and printing ink particles from pulp suspensions, particularly those produced in waste paper treatment. In this process, hydrophobic solids, such as printing ink particles or stickies, are brought into contact with gas bubbles

in a suitable flotation cell. The solids adhering to them are carried to the surface of the liquid along with the gas bubbles and can be removed there as foam. Since the pulp is hydrophilic, it is discharged together with the accept. As there is no 100% separation of fibers and ink particles or stickies, there is a direct relation here between the losses and the cleaning effect achieved.

Summary of the Invention

The task set by the present invention is to make a process available that overcomes the disadvantages of the processes already known for controlling operation of a flotation cell and provides a more flexible means of control.

In the process according to the invention for controlling operation of a flotation cell, the liquid level and the foam level in the cell are measured and controlled. The process is characterized by at least one quality characteristic of the accept leaving the cell being measured and the set value(s) for the liquid level and/or the foam level being determined on the basis of this quality characteristic.

Thus, unlike the state-of-the-art processes already known, operation of the flotation cell is controlled on the basis of the quality of the accept leaving the cell.

This makes the control system more flexible and maintains the process at an optimum in terms of energy consumption and loss of valuable resources.

The preferred quality characteristic measured should belong to the category containing brightness, whiteness, color type, number of dirt specks and/or number of stickies in the accept.

The liquid level in the cell is controlled by an outlet valve.

The foam level in the cell is controlled by the amount of air added. If a self-priming nozzle is used, this can be achieved by varying the

amount of liquid. If the air is blown in, the foam level can be set by regulating the amount of air directly. By targeted variation of the air quantity, the operating point can be optimised in terms of cleanliness, energy consumption, and loss of valuable resources, as well as in terms of fibre loss and ash removal in deinking flotation, for example.

Here, the following parameters influence the flotation result:

Foam level above liquid: A high foam level means less fibre loss and higher foam consistency, but also higher energy consumption in adding the amount of air required.

Foam height above the weir of the flotation cell: This value is proportional to the amount of foam overflowing. A large overflow is a sign of good cleaning efficiency, but also high losses.

These two parameters can be controlled independently of one another by means of the liquid level in the cell.

A further parameter is the bubble size: The bubble size influences the speed at which the bubbles rise and also the potential contact surface area. Thus, flotation can be set selectively to the size of the particles to be removed.

A preferred configuration of the process according to the invention is characterised by the flotation cell comprising several sub-cells. Here, the foam level can be measured in each of the sub-cells, or the foam level is only measured in one sub-cell or only in one part of the sub-cells.

The process according to the invention can be implemented in a primary flotation cell, but also in a secondary flotation cell.

The present invention also relates to use of the process according to the invention in flotation of a pulp suspension, particularly in deinking flotation.

Brief Description of the Drawings

The present invention may be better understood and its numerous objects and advantages will become apparent to those skilled in the art by reference to the accompanying drawings in which:

Figure 1 is a schematic diagram of a first embodiment of the invention and

Figure 2 is a schematic diagram of a second embodiment of the invention.

Detailed Description of the Preferred Embodiment

The illustration contains a diagram of the control system according to the present invention. The pulp for flotation flows through the inlet (3) into the liquid chamber (1). The air added through the air feed (6) generates the foam (2), which runs over a weir to the overflow (5). The foam (2) contains the pulp impurities, for example ink. The air can be added by means of compressors, self-priming nozzles, or similar. The cleaned liquid, or accept, leaves the plant through the outlet (4).

The liquid level is controlled via control loop (11) and the foam level via control loop (10). A quality metering system (12) measures at least one quality characteristic of the accept leaving the cell, for example brightness, dirt specks, or number of stickies. Generally, the quality characteristic that is measured depends on the application. In the subject method for controlling the operation of the cell, the measured value of the quality characteristic is used to determine the liquid level set value used by the liquid level control loop (11) and/or the foam level set value used by the foam level control loop (10).

The liquid chamber (1) may be divided into a number of sub-chambers, defining multiple sub-cells. In this variation, the foam level in each sub-cell may be measured, the foam level in only one of the sub-

cells may be measured, or the foam level in a limited number of the sub-cells may be measured.

The liquid chamber may be divided into a number of sub-chambers 1, 1', 1", defining multiple sub-cells (see Figure 2). In this variation, the level of foam 2, 2', 2" in each sub-cell may be measured. Alternatively, the foam level in only one or a limited number of sub-cells may be measured.

Each sub-cell has its own control loop 11, 11', 11" for the liquid level and its own control loop 10, 10', 10" for the foam level.

The flow of the liquid from one sub-cell to the next may be achieved by a pump 7, 7' in feed lines 3, 3', which is part of the control loop 11, 11', 11" for the liquid level. Alternatively, valves may be used for the flow control.

The quality metering system 12 is connected to the control loops 10, 10', 10" for the liquid level control and the control loops 11, 11', 11" for the foam level control to achieve optimum separation quality.

Many flotation processes employ multiple flotation cells, with some of the cells being used as primary cells and some of the cells being used as secondary cells. It should be appreciated that in such processes, the above-disclosed method may be used in one or more of the primary cells, only, in one or more of the secondary cells, only.